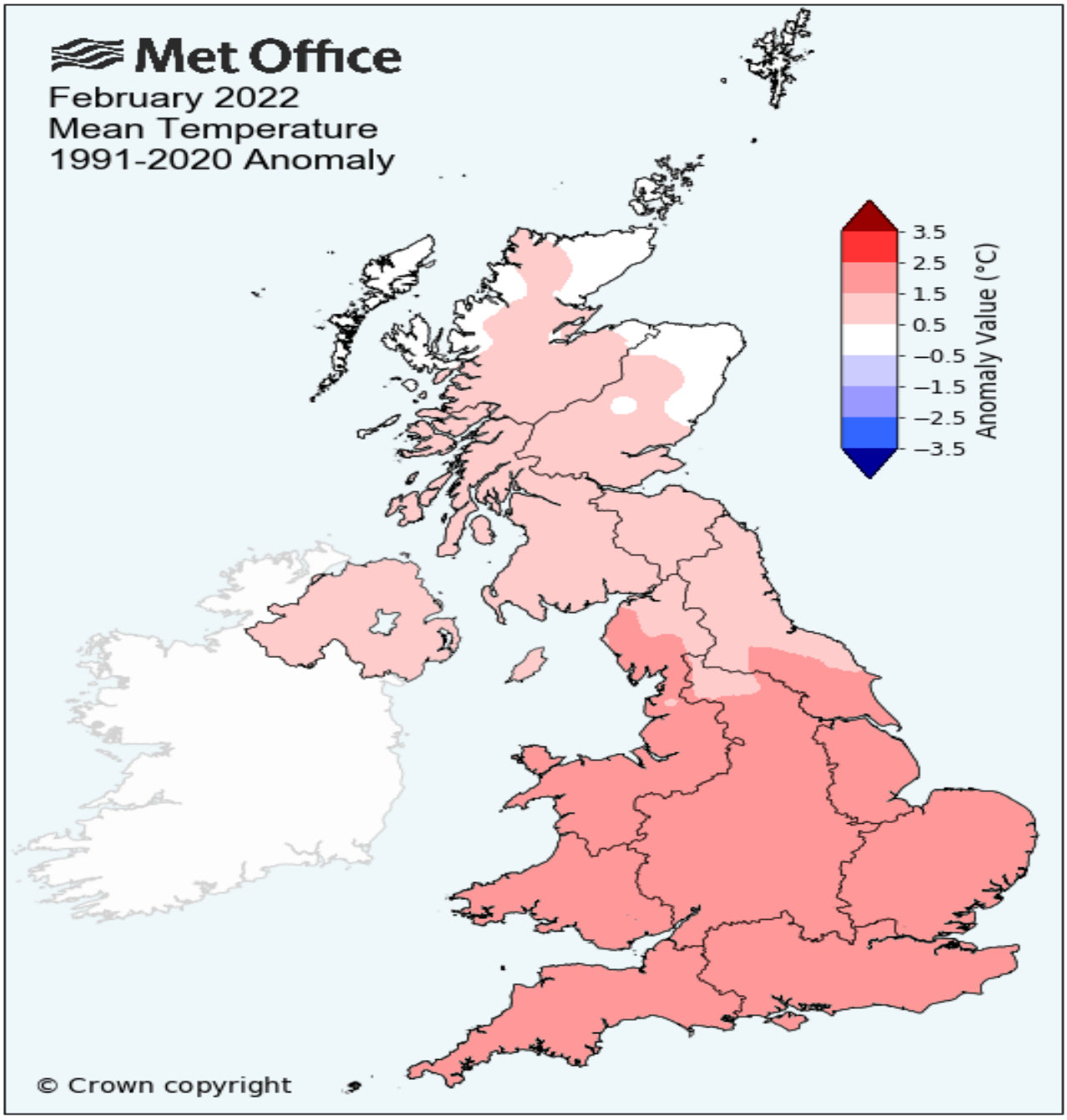
A mild winter blows out at the end!

Description

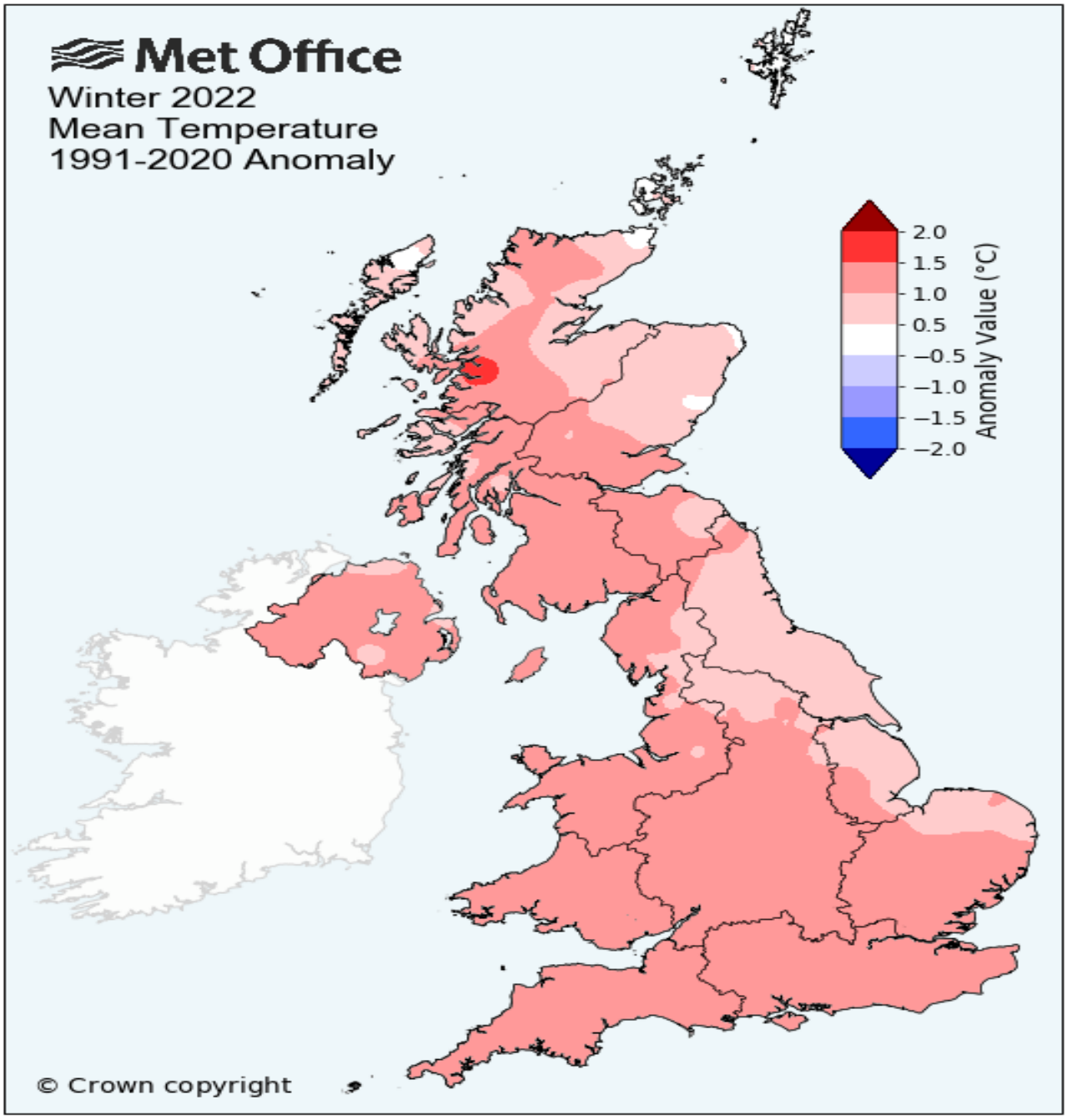
Three named storms in quick succession towards the end of February brought winter in the UK to a dramatic close, but as a whole it was one of the mildest winters on record.

Based on provisional data, it was the UK’s eighth warmest winter in terms of mean temperatures on record in a series from 1884. In terms of the countries of the UK by the same measure it was fourth warmest for both Northern Ireland and Wales, while England and Scotland were both ranked ninth. This means half the top ten mildest winters on record have now occurred since 2010.

During February temperatures have been above average by around 2 °C over most of England and Wales, and around a degree above average for southern Scotland and Northern Ireland, but just below normal for the far north.



The UK's mean temperature for the winter was 5.2°C, 1.1 degrees higher than the long-term average. The mean temperature for Northern Ireland was 5.8°C, and it was 5.9°C for Wales, 5.7°C for England and 4.0°C for Scotland.

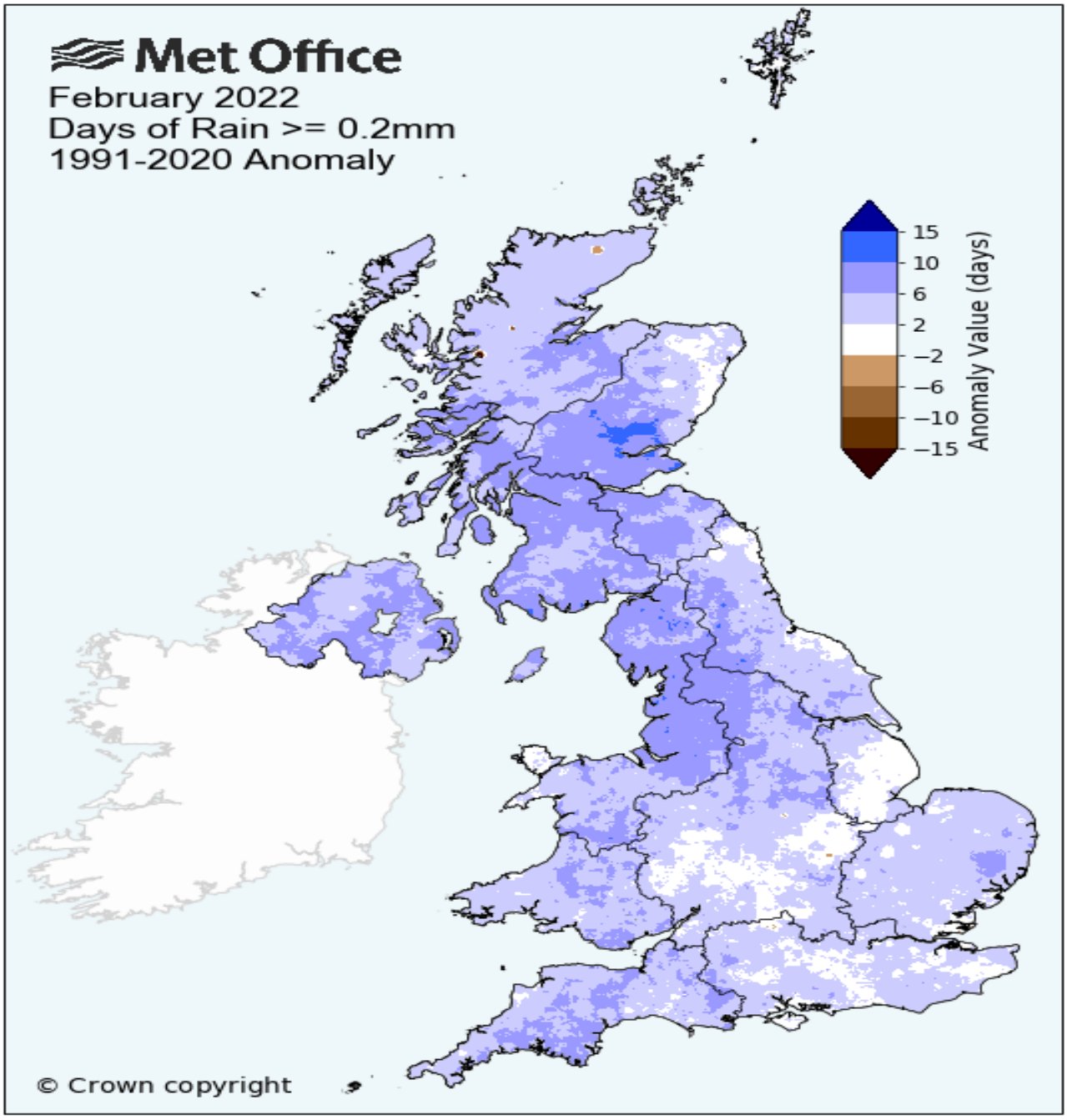


Three named storms affected the UK within the space of a week in February, the first time this has occurred since storm naming was introduced in 2015/2016. Two red severe weather warnings were issued for Storm Eunice, the most severe and damaging storm to affect England and Wales since February 2014. Winds gusted at over 81mph in exposed coastal locations and a gust of 122mph was recorded at Needles Old Battery, Isle of Wight, setting a new gust speed record for England. Winds gusted widely at over 69mph across southern England. These storms formed part of a turbulent spell of wet and windy weather for the UK, associated with a powerful jet stream.

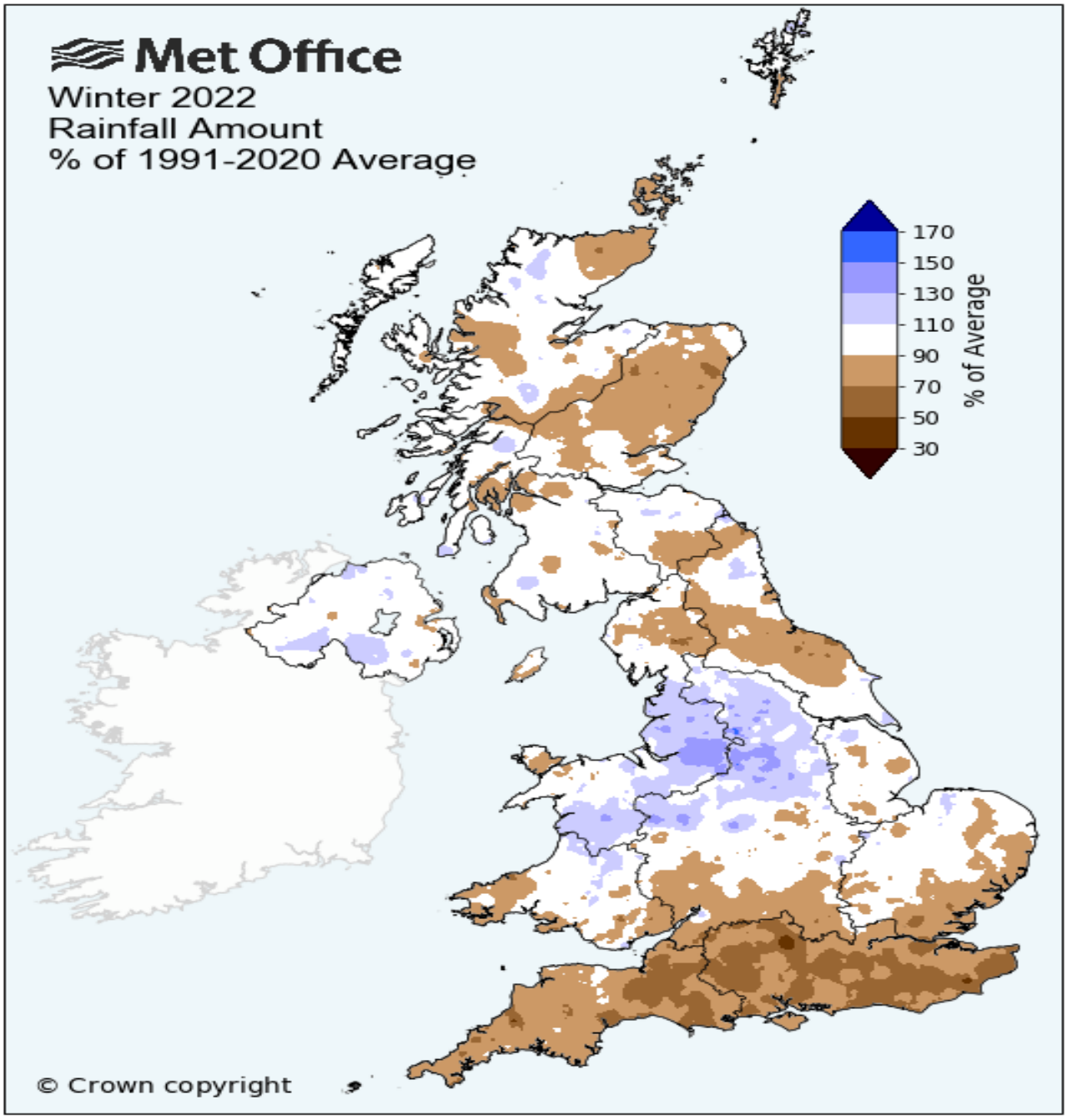
Storms Dudley and Franklin also brought significant weather impacts. Storm Dudley resulted in loss of power for thousands of homes across parts of Cumbria, Yorkshire and Lancashire, and rail lines

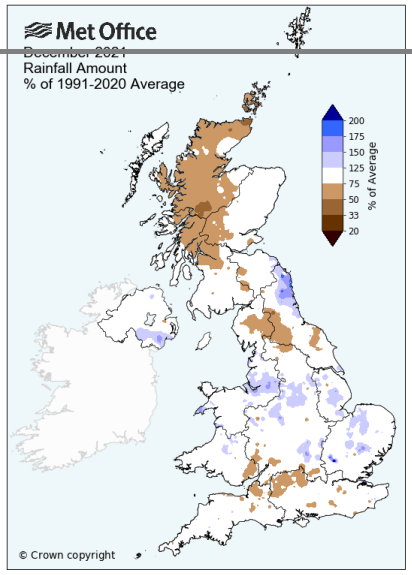
heading north to Glasgow and Edinburgh were disrupted. The strong winds from Franklin hampered clean-up operations following Eunice. The persistent heavy rain through this spell brought significant flooding problems in parts of England, Wales and Northern Ireland. Around 400 properties were flooded, with severe flood warnings issued for several major rivers including the Severn. In Yorkshire, the River Wharfe burst its banks and the lines at Rotherham Central station were flooded. However, fortunately severe coastal flooding in the Bristol Channel was avoided.

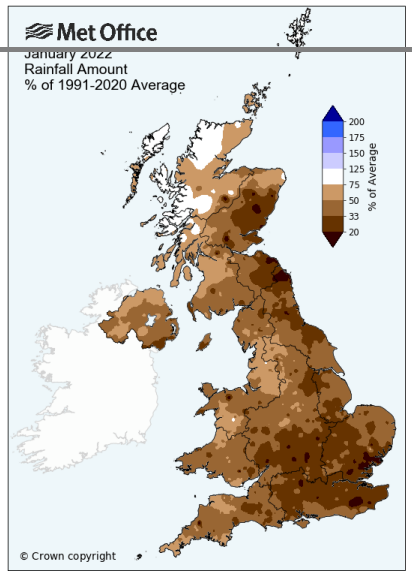
The storms were brought by an extremely active jet stream, that swept repeated weather fronts across the UK. This contributed to a wetter than average February, with the UK seeing its eighth highest February rainfall total on record. Rainfall has exceeded the monthly average almost everywhere, the south coast being the main exception, and numerous places have exceeded double their monthly average.

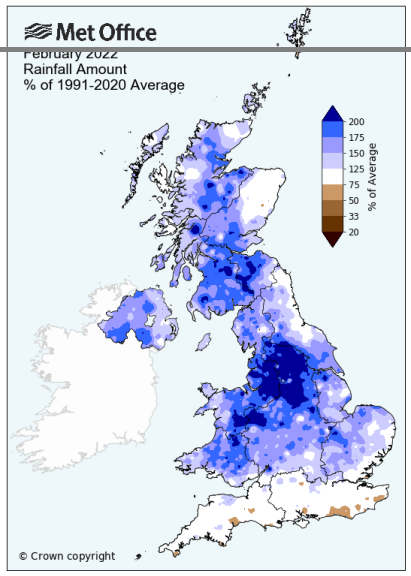


However, winter as a whole was slightly drier than average, with January in particular seeing low rainfall. This did see some regional variations though – while the south of the UK was very dry, some parts of the north were actually somewhat wetter than average.

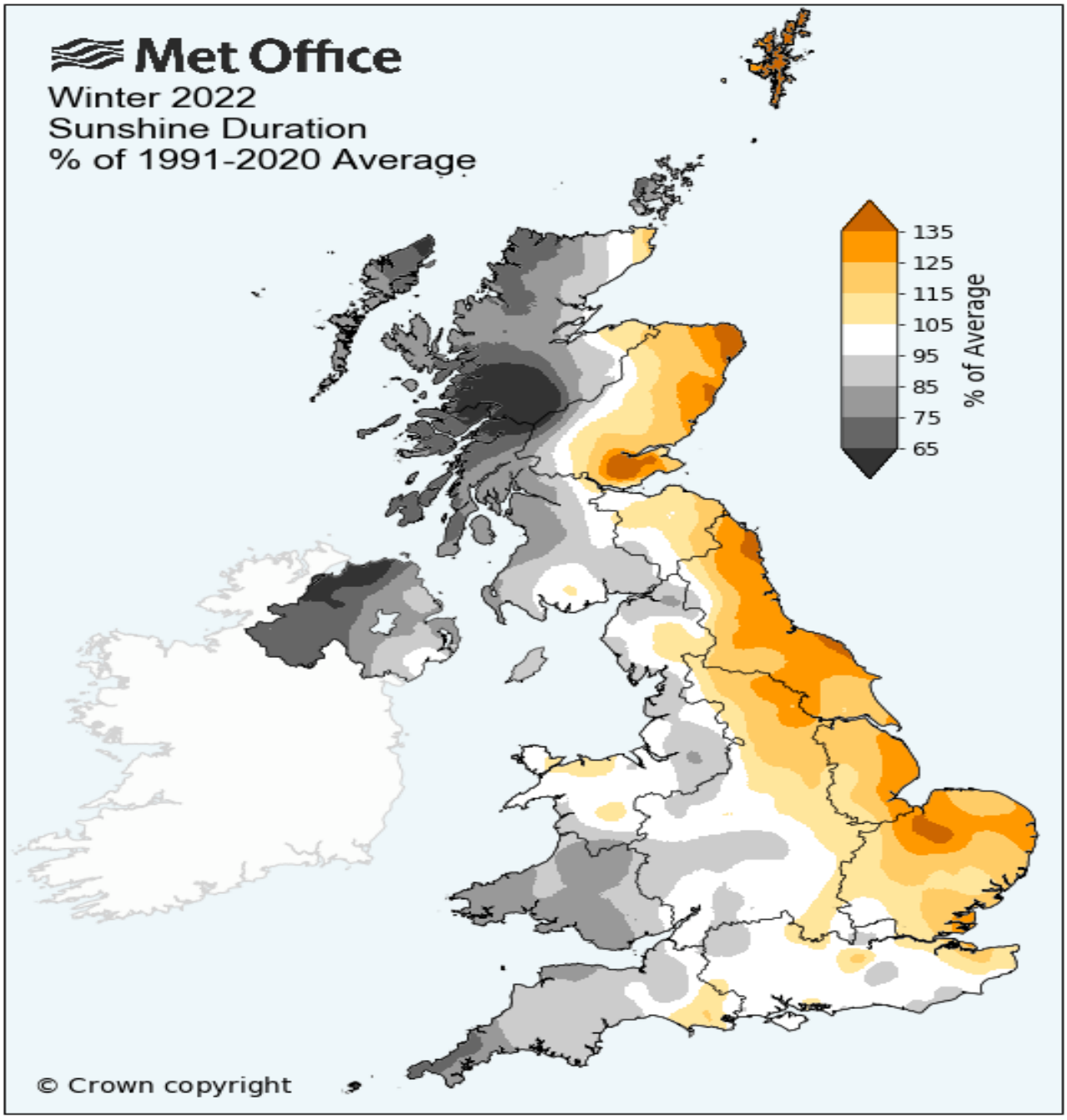

Met Office
Winter 2022
Rainfall Amount
% of 1991-2020 Average
170
150
130
110
90
70
50
30
% of Average
© Crown copyright







The eastern half of the UK saw much more sunshine than the west, with the north of England actually seeing its fifth sunniest winter ever with 115 per cent of its average sunshine hours, while Northern Ireland saw only 78 per cent of its average winter sunshine. England as a whole received 107 per cent of its average, while Scotland saw 96 per cent and Wales only 90 per cent.



Dr Tim Legg of the Met Office's National Climate Information Centre, said:

"The relative drama of the latter part of February belies the fact that the majority of the winter was fairly benign in terms of weather events, with relatively few frosts and little widespread wintry weather.

"However, once again we have seen a winter warmer than average, with the season's average temperatures in the top ten warmest since records began. This continues to paint a picture consistent with climate change projections and what we expect in long-term trends for the UK's winter weather."

You can read a summary of the three February storms and other significant events on our Past Weather Events page.

Check the latest forecast for your area on our website, by following us on Twitter and Facebook, as well as on our mobile app which is available for iPhone from the App store and for Android from the Google Play store.

Keep track of current weather warnings on the weather warning page.

For more information on how to prepare for severe weather, please visit our WeatherReady advice

Provisional February 2022	Mean temp (°C)		Sunshine (hours)		Rainfall (mm)	
	Actual	Diff from avg (°C)	Actual	% of avg	Actual	% of avg
UK	5.6	1.5	73.6	102	146.2	152
England	6.5	1.9	85.9	110	96.7	146
Wales	6.4	1.9	58	84	198.1	165
Scotland	3.8	0.7	61.2	96	215.6	153
N Ireland	5.7	1	49.6	74	144.6	158

Provisional Winter 2021/2	Mean temp (°C)		Sunshine (hours)		Rainfall (mm)	
	Actual	Diff from avg (°C)	Actual	% of avg	Actual	% of avg
UK	5.2	1.1	163.7	101	321.9	93
England	5.7	1.1	196.8	107	218.4	91
Wales	4.9	1.3	141.8	90	453.1	100
Scotland	4	1	122.8	96	458.8	93
N Ireland	5.8	1.2	115.1	78	328.5	100

Date Created
March 2022

Climate risk in an international context

Description

Climate change is a global phenomenon

From the Arctic to Antarctica, the tropics to mid-latitudes, the world is experiencing the consequences of increasing climate risk, writes Dr Kirsty Lewis: a Met Office Science Fellow working on climate science to support adaptation and development.

In the past 12 months alone, we have seen the most extreme heatwave in history over western North America, flooding in South Sudan which led to over 800,000 people being displaced, in India, Sri Lanka and the Maldives 200,000 people had to flee Cyclone Tauktae, while Hurricane Ida and the extensive flooding in Europe were two of the costliest weather events ever to occur

Globally the most vulnerable are most at risk

Although climate change is a serious threat across the globe, some of the very worst risks are in developing countries. This is not because the most serious hazards occur in these countries, although in some cases they do, but because developing countries are the most vulnerable. They are often highly sensitive to weather and climate and have low adaptive capacity to manage and recover from disasters. For example, the economies and food systems of many developing countries are highly dependent on rain-fed agriculture, making them very sensitive to changes in rainfall, flooding and drought, as well as climate-related pest and disease outbreaks, such as locusts.

In many cases these events occur in a context of communities that have few assets or safety net systems. Governments in the poorest countries have fewer options to deploy financial means to cushion the impact of extreme events, such as increasing food imports or underwriting insurance. Investment in adaptation to substantially reduce vulnerability and exposure is key to managing risk and enabling development.

Agriculture has always faced many hazards, including extreme weather events and crop pests and diseases. Additionally, farmers are now having to consider the impacts of climate change. Picture: Shutterstock.

Globalised risk

Climate risk is not just an issue for those countries directly affected in individual weather events. We live in a globalised world, and events in one location often present far-reaching impacts.

The UK's latest Climate Change Risk Assessment (CCRA3) international chapter sets out clearly the threat associated with global, complex and compounding risks for the UK. These risks can come from direct events, for example a severe storm that damages a strategically-important port and therefore disrupts supply chains. Or it can be the result of more indirect impacts, such as adverse climate conditions that, together with non-climatic factors, contribute to displacement or migration of populations, with knock on consequences for regional and global security. Complex interdependencies mean that there are sometimes surprising consequences from seemingly small or localised events. Increasing resource dependencies and a just-in-time delivery culture, mean there is little redundancy in many globalised systems, which further increases risk.

Managing international risks of climate

Climate risk is an international issue, and it will take international joined-up effort to tackle. Limiting global warming to 1.5 °C above pre-industrial levels, and thereby minimising the increase in climate hazard is an essential component to managing climate risk. Every degree of warming increases the scale of climate change impacts, and thus risk. Even 1.5 °C of warming though brings additional hazards, and so alongside mitigation it is critical that we adapt to the climate changes that cannot be avoided. This means acting to reduce exposure and vulnerability to climate hazards across the globe and not just here in the UK.

International delegates attending COP26 climate summit in Glasgow last year agreed efforts to reduce carbon emissions. Picture: Grahame Madge (Met Office).

International collaborative action on mitigation and adaptation were the key focus of the recent COP26 climate summit in Glasgow. The summit agreed efforts to reduce carbon emissions, to work towards a Global Goal on Adaptation, and to provide finance to support developing countries to manage their climate risks.

How does the UK help tackle international climate risk?

In addition to addressing domestic climate mitigation and adaptation issues the UK also engages in action on global climate risk. The CCRA3 identifies risks to supply chains and distribution networks to the UK, and the multiple risks to the UK from overseas climate impacts as critical priority concerns. As priority areas the UK government will respond to these in its upcoming National Adaptation Programme. More broadly the Foreign, Commonwealth and Development Office (FCDO) overseas aid budget supports some of the most vulnerable developing countries to adapt to climate change, which also contributes to managing international risk. The UK is also a leading contributor to the Risk-Informed Early Action Partnership (REAP), an international initiative that aims to make one billion people safer from disasters by 2025, through improving the efficiency and effectiveness of responses to weather and climate disasters.

Climate-smart adaptation is underpinned by robust evidence and tailored information to support action. The Met Office works on a wide range of projects collaborating directly with communities in developing countries, to better understand their vulnerability and exposure, and to tailor climate hazard information that enables informed adaptation decisions to build resilience to climate change. Projects like the Future Climate For Africa (FCFA) Future Resilience for African Cities and Lands project (FRACTAL) that co-developed climate information with key decision makers in cities in Southern Africa, or the GCRF-Agricultural and Food System Resilience: Increasing Capacity and Advising Policy project (AFRICAP

), which works to make agriculture and food production in Sub-Saharan Africa more productive, sustainable and resilient to climate change, all contribute to efforts to reduce and manage international climate risk.

Date Created
March 2022

Climate change forcing species on the move

Description

This week, the IPCC published a landmark report looking at the impacts of climate change, including on biodiversity.

The report expresses with high confidence that in Europe one of the key climate change impacts on wildlife will be shifts in ranges, with species generally following the warming climate northwards.

The Met Office's climate spokesman Grahame Madge is a keen amateur naturalist who has been following these changes for many years. On UN World Wildlife Day he looks at how climate change is affecting the species which occur in the UK.

In Europe and the UK naturalists have been noting for several decades that the ranges of many species have generally been drifting north and uphill. Since the 1960s there have been a good number of species, especially insects, which have colonised the UK from further south in Europe. Additionally there is some evidence that a number of species which are at the southern end of the range in the UK – those that are found on mountains or nearer the Arctic – have also shifted north.

In just over a quarter of a century the little egret has colonised most of the UK. Picture: Grahame Madge.

The pioneering work *A Climatic Atlas of European Breeding Birds*, published in 2008, produced a series of climate change projections for all of Europe's bird species. It revealed that for the average bird species the potential distribution by the end of this century will shift nearly 550 km north east, equivalent to the distance from Plymouth to Newcastle. The average bird's distribution will also be reduced in size by a fifth and overlap the current range by only 40 per cent. The atlas also showed that three quarters of all of Europe's nesting bird species are likely to suffer declines in range. In 2008, the Climate projections for some of these species show continued decline or even UK extirpation.

Although there may be other factors at play, such as persecution and habitat loss, these projections are now increasingly being realised as wildlife is forced to move in response to a changing climate, if it can.

Through meticulous recording schemes, naturalists have been noting the shifting distributions of many species, with a general trend towards species' ranges moving north with some crossing the Channel from Europe to colonise the UK.

Notable has been the spread of the little egret – a white heron once more frequent around the Mediterranean. It is now a familiar inhabitant across much of Britain, especially the south. Before 1996, the little egret was only a casual visitor to the UK with the first nests being recorded in Dorset. Today the little egret is a familiar bird along any stretch of river, wetland or foreshore. A number of other herons have been following in its footsteps, including the great white egret and cattle egret, both of which are becoming established in the UK countryside.

Long-winged Conehead. Picture: Grahame Madge

The spread of 'showy' species like the little egret have been easy to observe, but mirroring their spread

has been a multitude of smaller creatures whose shifts in ranges has been better appreciated by experts. In the 1940s, the long-winged conehead was more or less confined to the south coast of England, but today it is being recorded well up into the Midlands where it finds a similar climate.

Median Wasp. Picture: Grahame Madge

New species are being recorded in Britain for the first time every year. The median wasp was first seen in the UK in Sussex in 1980, but now it can be seen north to northern England.

Winged insects can be blown on favourable breezes or can find their way to new locations under their own power. When arriving in new areas they require suitable areas of habitat. The work of the Met Office's Biodiversity Working Group has helped provide a refuge for colonising species, including the Small Red-eyed Damselfly which was only first recorded in the UK as recently as 1999. I became familiar with this species in Bedfordshire, so I was delighted to be the first person to record it for the Met Office as the species has spread along the south coast to colonise our wildlife ponds at our Exeter headquarters.

Extinct as a British nesting bird, the wryneck is now only seen as a rare visitor. This individual was seen at Portland Bill. Picture: Grahame Madge

Climate change is providing an imperative for species to move their ranges and for some there are new opportunities. But for others the picture is bleaker. The wryneck is a bird which is adapted to warm summers, typical of continental Europe. It used to nest in the UK, but has become extinct as a nesting bird in the UK. Even though the climate in the UK should become more suitable for it, there are other challenges – such as a shortage of ant-rich grassland – which is creating a block to its recovery.

Climate change will increasingly affect every species and everyone of us. For some there may be opportunities but for others there will be huge upheavals. Adaption is key to lessening the risks from climate change and that includes ensuring that wildlife has the space it needs to adapt too.

Date Created
March 2022

Climate change and extreme events

Description

During February we saw a number of extreme weather events globally, and Professor Stephen Belcher and Professor Jason Lowe OBE wrote a blog post about preparing the scientific response to increasing climate challenges.

So, it is as timely as ever that this month we will be taking a closer look at extreme events, in particular droughts, heat, wildfires and rainfall/flooding. Indeed, one of the five Reasons for Concern (RFCs) identified by the Intergovernmental Panel on Climate Change (IPCC) is the risk posed by extreme events. In this blog post Professor Peter Stott, Science Fellow in Climate Attribution at the Met Office Hadley Centre, will explore changes to extreme events we are already seeing around the world.

Climate change attribution

In order to determine whether a particular weather event has been made more severe or more likely by climate change, attribution studies use simulations of climate made by computer models. One of these set of simulations represents the current climate, including anthropogenic (human-induced) climate change, whilst the other set of simulations represents the natural climate where the influence of increasing greenhouse gas concentrations and other human factors has been removed. Comparing the outcomes from the two sets of simulations allows us to assess the level to which climate change has impacted the weather.

Rainfall and flooding

In the last week of February parts of the UK saw some significant flooding following a series of storms, a reminder of the impact the weather can have on lives and livelihoods. At the same time, communities in Australia have experienced devastating floods and a number of people have tragically lost their lives.

Analysis is needed to determine whether these specific events were made more likely due to anthropogenic climate change, but trends in climate data indicate that there have been increases in extreme rainfall globally since the beginning of the twentieth century – we explored this in a blog post last year. There is also a large body of evidence that has found links to climate change following a number of specific heavy rainfall events.

An attribution analysis of the wettest February on record for the UK (which occurred in 2020) showed that the extreme rainfall experienced was made about three times more likely due to climate change[1]. Meanwhile an attribution study of the flooding in central Europe in July 2021 showed that climate change had increased the intensity of daily maximum rainfall by 3-19%[2].

Flooded Brisbane River at Colleges Crossing, Ipswich, Queensland, Australia 1st March 2022

Heat

The recent Working Group II report from the IPCC[3] highlighted some of the impacts we are already seeing from extreme heat in terms of biodiversity and heat stress, for example in cities, in many regions around the world.

July 2019 saw record breaking temperatures across the UK and Western Europe. In Cambridge 38.7°C became the UK's highest daily maximum temperature. An attribution study considered whether the intensity and likelihood of seeing such high temperatures in Europe has been influenced by climate change, concluding that the event was made 10 times more likely in the UK and temperatures were 1.5 to 3°C hotter due to human driven climate change[4].

Wildfires

In 2020 a rapid response review of 57 peer-reviewed papers[5] concluded that wildfires are becoming more severe and widespread, highlighting the links between climate change and increased frequency or severity of fire weather. This conclusion was supported in the IPCC Working Group I report[6] published in 2021 which stated that "fire weather conditions (compound hot, dry and windy events) have become more probable in some regions".

In one high risk region, studies under the Climate Science for Services Partnership (CSSP) Brazil project (supported by the UK Government's Newton Fund) have been looking at how wildfires in the

Amazon rainforest may change in the future. Part of this work has led to the development of a fire probability forecast service to help support planning strategies to reduce the risk and impact of fires.

Australia Bushfires

Droughts

Currently the Iberian peninsula is experiencing a prolonged winter drought which began in November 2021[7]. Identifying a direct link between climate change and drought is complicated, but there is increasing evidence that our changing climate is influencing rainfall patterns in many regions around the world. The IPCC Working Group I report highlighted the increased prevalence of observed droughts in recent years.

Specific research has drawn similar conclusions. Research within the CSSP China project indicated an increase in flash droughts. One attribution study focused on a severe drought event that occurred between May and June 2019, in southwestern China, severely damaging crops. At the peak of the event, average rainfall was the lowest on record since 1960 for the region and the lack of rainfall impacted the drinking water supply of over 824,000 people. Scientists from the project found that human driven climate change increased the likelihood of such an event by a factor of six[8].

An impetus for action

We can be more confident than we've ever been about linking extreme weather events to climate change, as seen in the evidence above. The increasing chances of these extreme events continue to rise as long as we continue to emit greenhouse gases. The science is clear that the faster we reduce our emissions of greenhouse gases, the more we can avoid the most severe impacts of climate change. In addition, we need to consider how we adapt to our changing climate to minimise the impacts we are already experiencing and can expect in the years ahead. Later this month we will take a look at what climate projections are telling us about extreme events in the future.

Learn more about why we need to adapt to our changing climate here and look out for more on reducing emissions – mitigation – next month.

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[1] Davies et al 2021 https://rmets.onlinelibrary.wiley.com/doi/10.1002/wea.3955

[2] Kreienkamp et al 2021 https://biblio.ugent.be/publication/8732135/file/8732138

[3] IPCC, 2022: *Climate Change 2022: Impacts, Adaptation, and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O.

Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.

[4] World Weather Attribution https://www.worldweatherattribution.org/human-contribution-to-the-record-breaking-july-2019-heat-wave-in-western-europe/

[5] https://sciencebrief.org/briefs/wildfires

[6] IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.

[7] https://earthobservatory.nasa.gov/images/149469/iberian-peninsula-drought

[8] Lu et al. 2021 https://journals.ametsoc.org/view/journals/bams/102/1/BAMS-D-20-0128.1.xml

Date Created
March 2022

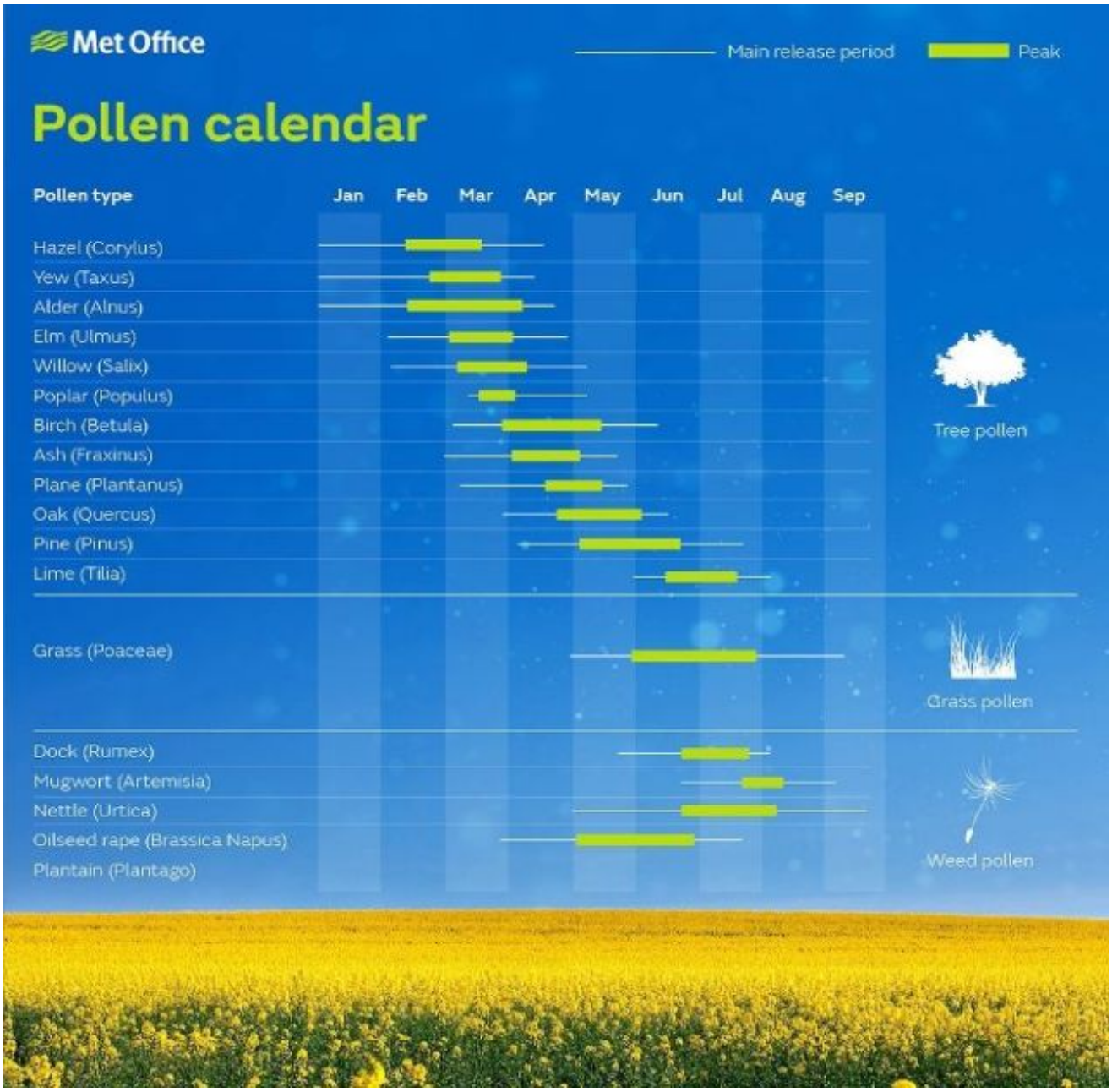
What’s the outlook for hay fever sufferers this year?

Description

As much of the UK continues to see mild spring weather this week, the thoughts of some near-10million people in the country will be starting to turn towards the dreaded symptoms of hay fever.

After a mild week for most, with temperatures in the teens for much of the country, the Met Office’s pollen forecast is once again available for all to use. It can be found online and in the app and provides a pollen forecast five days ahead across the whole of the UK.

There are around 30 different types of pollen that can cause hay fever, and people can be allergic to more than one type.



A calendar showing the ‘normal’ pollen season.

Unfortunately for around one-in-five hay fever sufferers in the UK, the pollen season could start earlier than normal this year thanks, in part, to the recent mild weather many of us have seen. However, grass pollen, which most hay fever sufferers have an allergy to, won’t be starting until later in the year.

The Met Office’s Yolanda Clewlow, Relationship Manager for Health and Air Quality Services, said: “The birch pollen season is expected to start earlier than normal this year, with central and southern areas of the UK starting to feel its influence later on this month.

“In addition, the relatively mild winter we saw also opens the possibility of an earlier-than-average oak pollen season – possibly mid-April – and also an earlier grass pollen season, although that will depend on the conditions for the rest of spring.”

According to mean temperature figures, the UK had its eighth mildest winter on record in a series that dates back to 1884, and this has given nature a bit of a head start in front of average pollen seasons.

Yolanda continued: “People normally get hay fever symptoms when the pollen count, which is a measure of the number of grains of pollen in one cubic metre of air, exceeds 50 and it’s the tree pollen that we’ll be looking at most closely in the coming weeks.

“It’s too early to say how much pollen will be released this year, but the pollen forecast provides a good indication of the next five-day period and we’ll know more about the types and amount of pollen likely to be released as we move through spring.”

Grass pollen is the most common cause of allergies, affecting 95% of hay fever sufferers with much fewer people affected by tree, weed and other pollen species.

Most hay fever sufferers are allergic to grass pollen, although you can be allergic to more than one type of pollen.

With mild conditions expected to be largely dominant through the weekend, keep an eye on the pollen forecast for your area on the Met Office website or on the app.

Check out the advice for dealing with hay fever on the Met Office website.

Find out how different types of weather affect the production, distribution and dispersion of pollen.

Find out more about pollen allergies and hayfever.

For information on protecting yourself from ultraviolet radiation from the sun, check out the UV forecast from the Met Office.

Date Created

March 2022

Met Office contributes to landmark artificial intelligence conference

Description

On 22-23 March, the Alan Turing Institute is hosting Artificial Intelligence UK (AIUK). Broadcast live from London, this virtual event presents a showcase of the UK's latest research into Artificial Intelligence (AI) and data science to explore how the pioneering work and collaboration taking place in these fields can be applied to solve real-world challenges.

AI UK is hosted by the Alan Turning Institute

The Met Office is partnering the event, which will see panel sessions, demonstrations and talks from a range of thought leaders in the data science sector. Chief Met Office Scientist, Professor Stephen Belcher, took part in this morning's panel session "*AI and climate: a cause for hope?"* in which speakers reflected on COP26 and the role of AI in the path to net zero and climate change adaptation over the next decade.

AIUK comes at a time of pivotal growth for Artificial Intelligence, and an expansion in what is possible brought about by an explosion in data, increased availability across a broad spectrum of computing and growing expertise in data science approaches (including machine learning and AI). An acceleration in the development and adoption of new data science presents an enormous opportunity, offering significant gains in efficiency and performance to most sectors, including but not limited to weather and climate science and services.

Dr Kirstine Dale, Principal Fellow for Data Sciences at the Met Office and Co-Director for Joint Centre for Excellence in Environmental Intelligence said: "We're in the midst of a revolution in Artificial

Intelligence, where the world's fastest-growing deep technology has the potential to rewrite the rules of entire industries, fundamentally changing the way we work and live.

"At the Met Office we're committed to harnessing the power of data science to push the frontiers of weather and climate science and services."

The Met Office works in partnership with a range of institutions to fulfil ambitions within data science. For example, the Joint Centre for Excellence in Environmental Intelligence was launched in 2020 with the University of Exeter, while the Met Office works collaboratively with the Alan Turning Institute, as well as leading universities, to further explore the applications of data science within weather, climate and AI.

Kirstine continued: "Working at the cutting edge of this transformative technology requires collaboration, and that's why we're engaging with world-leading partners in the application of machine learning, data science and AI.

"By working together with other organisations in this area, we're able to fully explore and embrace different opportunities and challenges within data science."

One such challenge is space weather: by deploying machine learning and data driven techniques, the Met Office hopes to improve how earth system models model the thermosphere – the part of our atmosphere where many satellites fly. These techniques would enable improvements to the model in areas where either the science hasn't been fully discovered or when the process is too computationally intensive to fully model and so must be approximated.

Theo McCaie, Head of the Informatics Lab and Technical Lead for Data Science said: "The earth's system is extremely complicated and events that happen lower in the atmosphere can affect the thermosphere and vice versa. However, modeling an atmosphere 600km thick all the way around the earth is scientifically challenging and computationally very expensive.

"We are researching the use of machine learning techniques to emulate some of the atmospheric processes such as gravity waves. These emulations could be computationally much, much cheaper and possibly more accurate. Alongside this we are using data driven techniques to improve the existing model components to make them more accurate. Used together, these techniques could make modelling and forecasting in the thermosphere timelier and more accurate, leading to a safer, more reliable environment for the space-based components of many of the services we rely on day to day.

"Space weather is just one example of the application of Data Science. We don't know what the next advancements or opportunities will be in AI, but we're making sure that we'll be ready to take advantage of them, ensuring that we fulfil our purpose to help people make better decisions to stay safe and thrive."

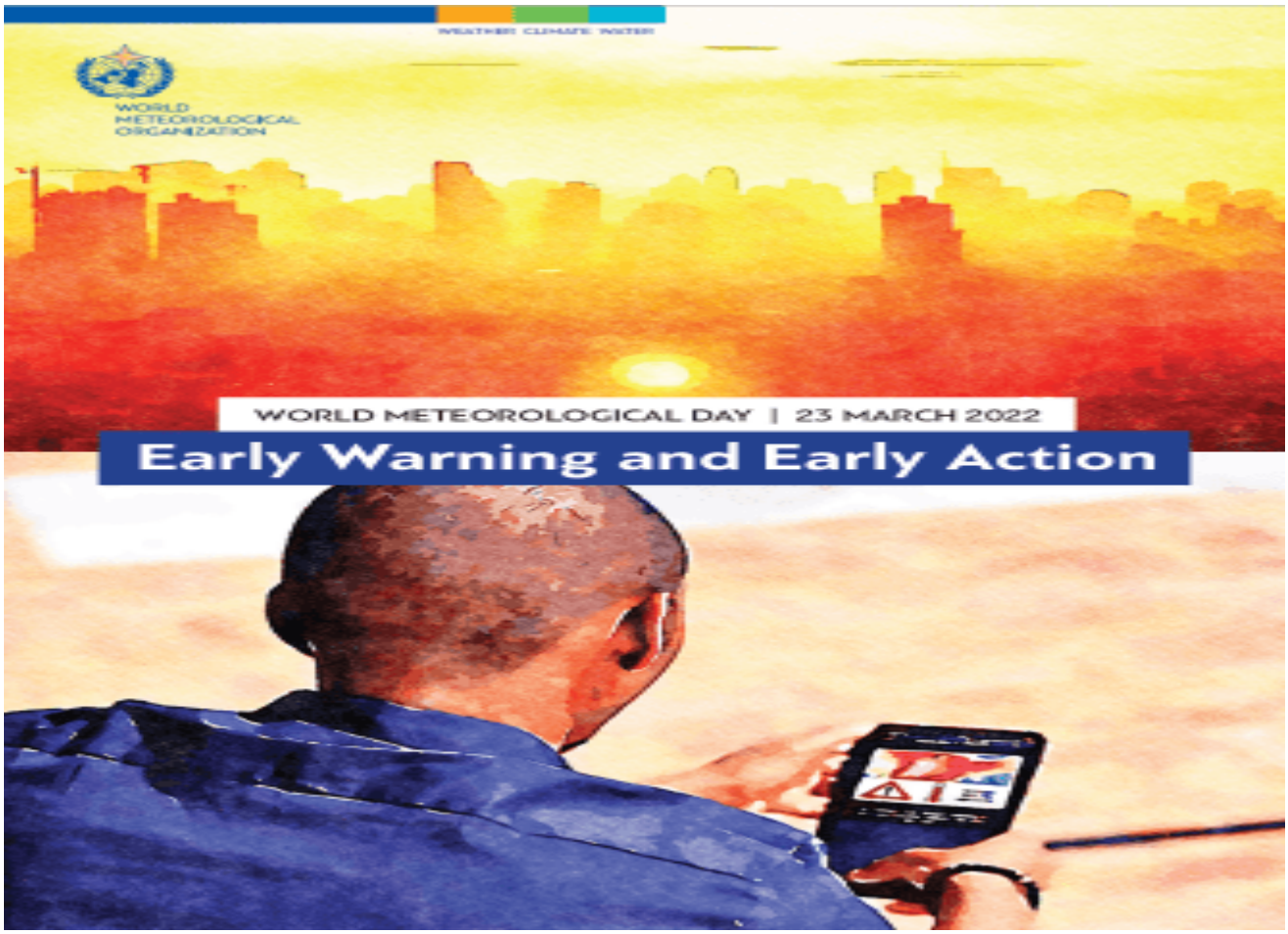
Date Created
March 2022

World Meteorological Day 2022

Description

World Meteorological Day takes place every year on 23 March to celebrate the founding of the World Meteorological Organization (WMO) in 1950. The theme of this year's event is "Early Warning and Early Action," and the day will spotlight the vital importance of hydrometeorological and climate information for disaster risk reduction.

Extreme weather and climate events are occurring more frequently across the world as a result of climate change, leaving us more exposed to the hazards that come with these conditions. Evidence of observed changes in extremes such as heatwaves, heavy precipitation, droughts and tropical cyclones has strengthened in recent years, as has their attribution to human influence. You can read more on this in our recent blog post.



World Meteorological Day 2022 – Early Warning and Early Action

As a world leader in weather and climate science, the Met Office delivers products and services in the UK and countries across the globe, including supporting the general public, government and local authorities through its weather forecasts. However, straightforward weather forecasts are not always

enough to enable people to take informed action. Experts, including the WMO, are calling for more impact-based forecasting to highlight what the weather will do and the impacts that this could have, with early warning systems being crucial to save lives and livelihoods.

The WMO are calling for greater coordination between national meteorological and hydrological services, disaster management authorities and development agencies, which is fundamental to better prevention, preparedness and response. Within the next five years, everyone on earth should be protected by early warning systems against increasingly extreme weather and climate change, according to an ambitious new United Nations target announced today.

Early warning systems for detecting dangerous weather are only useful if they are met with early action, which has become more important than ever as the world has seen the number of extreme climate events intensify.

Will Lang, Head of the Met Office's National Severe Weather Warning Service says, "here in the UK, our warnings consider both the potential for severe weather and its impact on people, properties and our infrastructure. We can then suggest the most effective actions for people to take to look after themselves, their families and their communities. Tragically, major storms such as those we experienced earlier this year can lead to fatalities and widespread damage, but these impacts can be reduced through early warning and early action."

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March 2022

Rainfall Rescue Project – bringing archived data back to life

Description

At the Met Office National Meteorological Archive in Exeter we look after the ‘national memory of the weather’, writes Catherine Ross, the Met Office’s archivist.

This archive consists of the millions of meteorological observations produced by the Met Office since its incarnation in 1859 and a large collection of supporting data and information from across the globe.

Catherine Ross – Met Office archivist – with part of the vast Met Office archive: the national memory of weather. Picture: Grahame Madge, Met Office

Among this treasure trove of climatological data are the Ten Year rainfall books, which are not very well named, and are actually folders of loose paper sheets! They hold a vast and hitherto largely untapped supply of monthly rainfall data from 1677 – 1960.

The earliest data comes from a range of different published and unpublished sources. From 1860 data was sent into the British Rainfall Organization, and later the Rainfall Branch of the Met Office, by a network of observers from all around the British and Irish Isles.

Rainfall observation proved popular! When George Symons established the British Rainfall

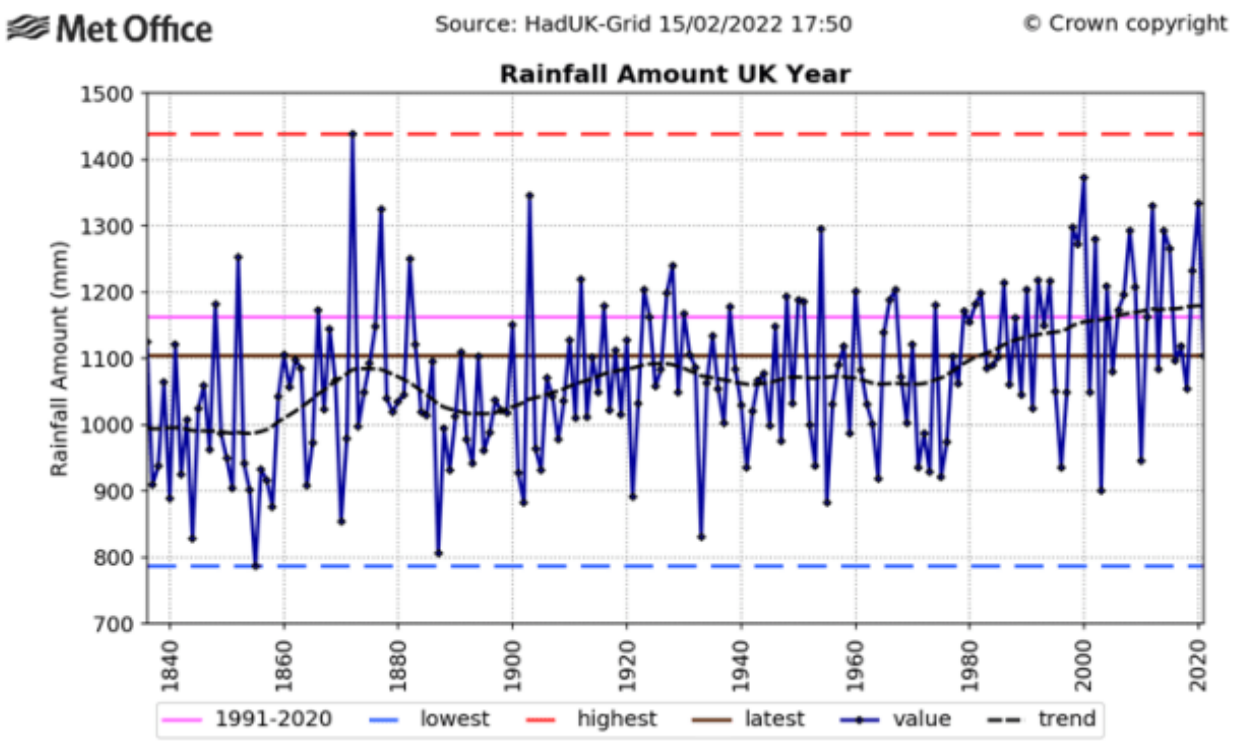
Organization in 1860 there were already several hundred rain gauges and this number increased to several thousand over the following 30 years. All of them diligently cared for and monitored by volunteer observers, some of whom dedicated many decades of their lives to the careful collection of rainfall data.

One challenge in using the data is that each folder contains ten years of data for every station, so you have to go through every single folder to find all the data for one place. The data series was therefore a perfect candidate for scanning in the archive. One year and 66000 sheets of paper later we had a lot of digital images loaded to our Digital Library and Archive, but to make best use of them, the data still needed transcription.

That's where Ed Hawkins, the Zooniverse platform and the RainfallRescue.org site came in. The national lockdown in March 2020 also provided a sudden supply of people with spare time on their hands and quite incredibly 16000 volunteers transcribed all 66000 pages (containing 5.28 million numbers) within 16 days.

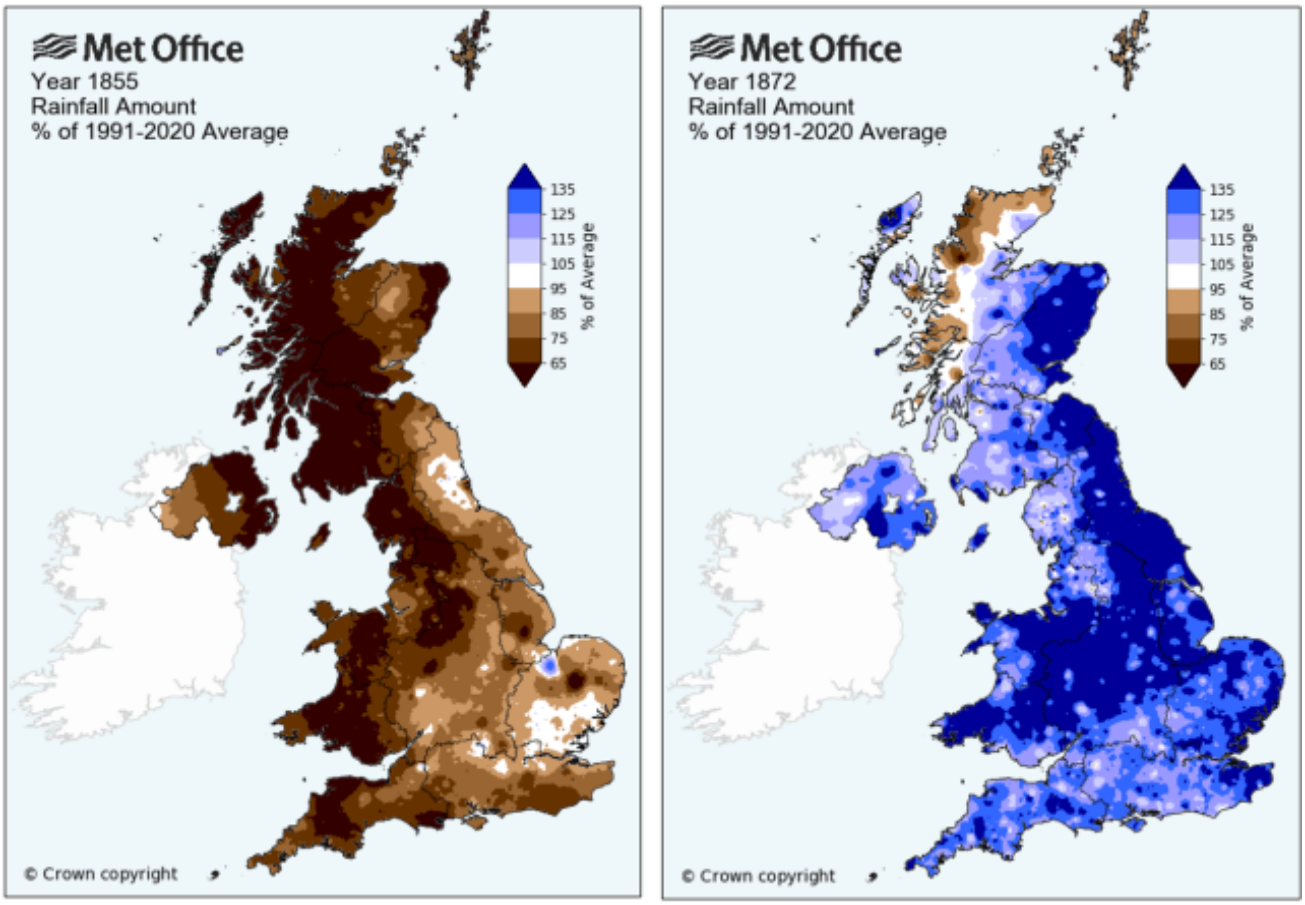
In fact each number was transcribed four times for quality control, so the 16,000 volunteers actually transcribed 21 million observations and with the additional collection of location information the total keystrokes are estimated at 100 million!

It was great to see the work of the volunteers of 2020 bringing the records of those volunteer observers of the 18th, 19th and early 20th centuries back to life. After a rigorous process of checking by a team from Reading, the Met Office and eight dedicated volunteers from the original project, a large tranche of that data has been added to the official Met Office national rainfall climate series. Rainfall Rescue now accounts for 84% of the monthly observations in the HadUK-Grid for 1836 – 1960!



UK annual rainfall statistics.

From this work we now have a record of UK-wide rainfall variations and trends back to 1836. To understand the risks from climate change and weather extremes we need to understand the past. Rainfall in the UK is notoriously variable, we are an island nation prone to both flood and drought. Therefore to capture past extremes we need long historical climate records. The figure below shows annual rainfall averaged across the whole of the UK back to 1836. A general increase in rainfall is evident, but the driest year in the series is 1855 and the wettest 1872 with the new data allowing us to map these extremes in more detail than ever before.



Driest and wettest years in the UK rainfall record.

Not only has all this work been achieved incredibly quickly, it has also broken the definition of what makes a record archival. In its lifecycle a document moves from being a record – in everyday use – to an archive where it is kept as part of a memory – in our case the memory of the weather. The 66,000 sheets of numbers certainly count as that, but in their new transcribed form the same numbers are ‘living a new life’ as part of the datasets available for daily use by scientists at the Met Office and around the world. It’s a little like a parallel universe for archives! We think this is great, but we’re also loving the fact that this goldmine of data is now back in the hands of the scientists who need it.

You can read more about the project in our press release here.

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Extreme events on the increase in a changing climate

Description

Earlier this month Professor Peter Stott examined extreme weather events around the world and how attribution studies can assess whether these are as a result of anthropogenic (human-induced) climate change. But what does the future hold? Can we expect to see more extreme events? Here we explore what the science tells us in relation to droughts, heat, wildfires and rainfall/flooding.

Rainfall/flooding

We mentioned in our earlier blog post that an attribution analysis of the wettest February on record for the UK (which occurred in 2020) showed that the extreme rainfall experienced could become nine times more likely by the end of the century than in pre-industrial times[1]. Wet weather events such as these are expected to increase over the coming decades in the UK.

The latest Intergovernmental Panel on Climate Change (IPCC) report states that “it is virtually certain that, in the long term, global precipitation will increase with increased global mean surface temperature”. Warmer air holds more moisture, which is one of the reasons a rise in global temperatures will result in more rainfall in some regions around the world. Particularly high levels of precipitation can occur due to slow-moving storms, with the potential for high rainfall accumulations

projected to be fourteen times more frequent across Europe by 2100 (for 4.3°C of global warming – a high emissions scenario)[2].

Natural variability, particularly in places such as the UK, can make it more difficult than with temperature extremes to separate the contribution of anthropogenic climate change from other influences on heavy rainfall events. It is not yet possible to discern underlying changes in local rainfall extremes above natural variability using only the observation record[3]. Research following record-breaking rainfall in October 2020 has indicated, however, that days with extreme rainfall accumulations will become more frequent through the century[4].

Heat

In the UK and around the globe, recent years have seen a number of record-breaking temperatures. In June 2021 Canada hit its highest recorded temperature of 49.6°C – you can find out more about this in our latest MostlyClimate podcast with a guest speaker from Environment and Climate Change Canada – and Australia recorded its joint hottest day on record in January of this year with 50.7°C.

In the UK we can expect to see hotter, drier summers in the future, with temperatures similar to the 2018 joint-hottest summer on record around 50% more likely by 2050 even in a low emissions scenario [5]. A study following the highest recorded UK temperature (38.7°C in July 2019) considered whether exceeding 40°C is within the possibilities of the UK climate[6]. Lead author, Met Office Senior Scientist Dr Nikolaos Christidis, concluded that, “the likelihood of exceeding 40°C anywhere in the UK in a given year has been rapidly increasing, and, without curbing of greenhouse gas emissions, such extremes could be taking place every few years in the climate of 2100.”

If the average global temperature reaches 2°C above pre-industrial levels, the number of people in regions across the world affected by extreme heat stress – a potentially fatal combination of heat and humidity – could increase nearly 15-fold. The new interactive atlas from the Intergovernmental Panel on Climate Change (IPCC), which shows possible climate futures for temperature and precipitation, highlights the importance of minimising future global warming.

Wildfires

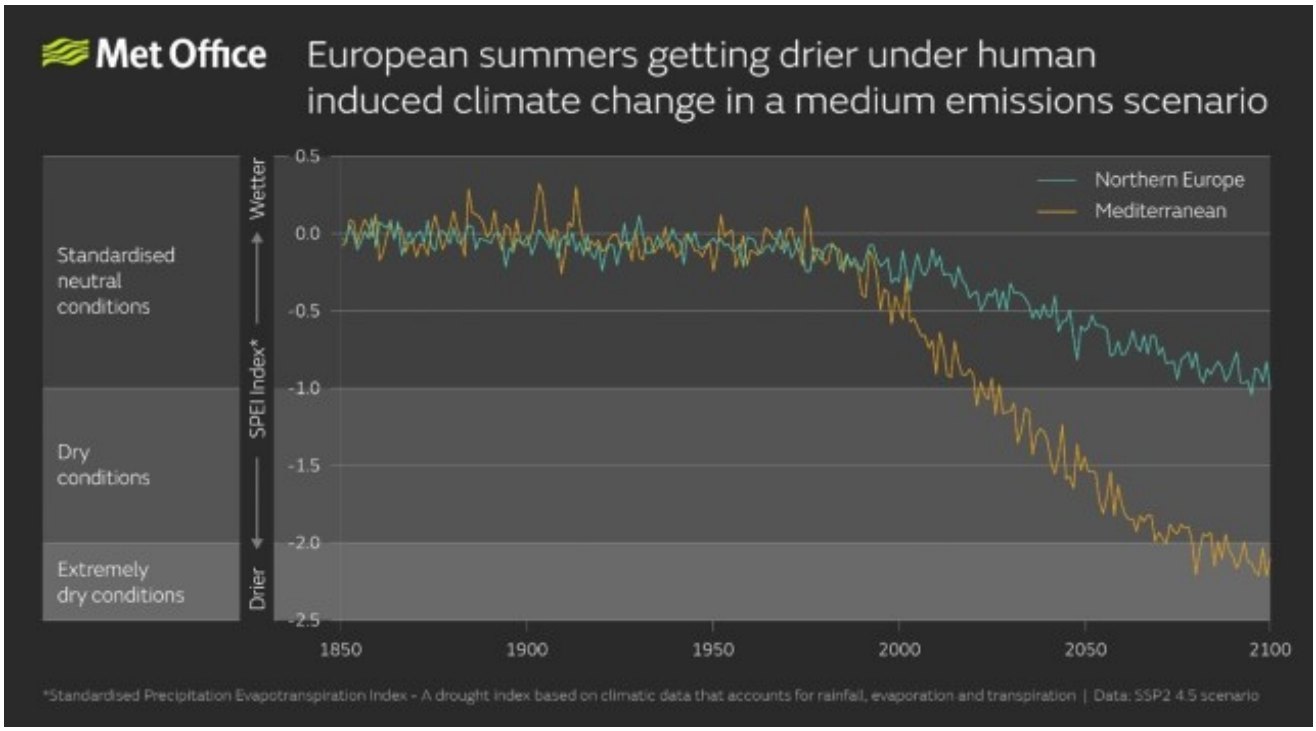
Wildfires are often tied with significant drought in the UK. Increased temperatures and reduced humidity [7] are likely to lead to a greater risk of fire danger in the UK by the end of the century if temperatures are not kept below 2°C and even at this level of warming the risk could double[8].

A recent United Nations Environment Programme report has predicted that even if greenhouse gases are reduced, there could be a global increase in extreme wildfires of up to 50% by the end of the century. The report, which included contributions from the Met Office and the UK Centre for Ecology & Hydrology, found that some of the biggest increases will be in areas not typically used to seeing wildfires, such as the Arctic and central Europe. Areas of tropical forest in Indonesia and the southern Amazon are also likely to see increased burning if greenhouse gas emissions continue at their current rate.

Research published on the Amazon rainforest last year found that a shift to hotter and drier conditions in the future could result in a greater burned area and resultant fire emissions. The Amazon rainforest is a natural carbon sink, removing and storing carbon from the atmosphere. With global warming limited to 1.5°C above pre-industrial levels, climate model experiments show a reduction in carbon storage of 7%. However, if warming were to increase to 4°C, the loss of carbon storage from these ecosystems could be as much as 30% highlighting the importance of understanding the link between climate change, fire risk and the carbon cycle which could be used to inform fire and land-use management strategies.

Droughts

2010-2012 saw an exceptional drought in the UK, one of the most significant for some regions of England in 100 years[9]. Research published last year using UKCP18 data indicated higher frequency and more severe long-term droughts in the UK, with droughts at least as severe as the one experienced in 2010 increasing by 86% at a 2.0°C level of global warming and by 146% at 4.0°C. The chart below also shows how summers are expected to become drier relative to typical conditions across both southern and northern Europe between now and 2100, with more extreme dry summers in the south[10].



A climate risk report completed earlier this year for the East Africa region indicates a projected increase in variability of seasonal rainfall could result in more frequent wetter and drier years and a higher risk of flood and drought events. These have the potential to impact socio-economic development by affecting sectors such as agriculture, electricity generation and health.

Taking action to minimise impacts

As explored earlier this month, we are already seeing an increase in extreme events attributable to climate change. Climate projections clearly indicate that we can expect further rises in many of these in the coming decades both in the UK and around the world. Limiting carbon emissions in order to minimise future warming can help stave off the worst of these impacts, which is why the 2021 Glasgow Climate Pact recognised the imperative to 'keep 1.5°C alive' and ensure that global temperatures do not go above this level. In order to combat the effects of these extreme events, we will also need to adapt to our changing climate, recognising that we are already seeing impacts and that, even if we stopped all carbon emissions today, we would see impacts of climate change long into the future.

We have been sharing information on extreme events on our social media channels this month. Follow #GetClimateReady to learn more and look out for a focus on mitigation soon.

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[1] Davies et al 2021 https://rmets.onlinelibrary.wiley.com/doi/10.1002/wea.3955

[2] Kahraman et al 2021 https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020GL092361

[3] Kendon et al 2018 https://journals.ametsoc.org/view/journals/clim/31/7/jcli-d-17-0435.1.xml

[4] Christidis et al. 2021 https://rmets.onlinelibrary.wiley.com/doi/10.1002/asl.1033

[5] UKCP18

[6] Christidis et al 2020 https://www.nature.com/articles/s41467-020-16834-0

[7] Arnell et al https://centaur.reading.ac.uk/96625/8/Arnell_2021_Environ._Res._Lett._16_044027.pdf

[8] Perry et al https://nhess.copernicus.org/articles/22/559/2022/nhess-22-559-2022-discussion.html

[9] Kendon et al https://rmets.onlinelibrary.wiley.com/doi/10.1002/wea.2101

[10] https://www.metoffice.gov.uk/about-us/press-office/news/weather-and-climate/2021/drier-european-summers-projected-under-human-induced-climate-change

Date Created
March 2022

How is the British Red Cross helping people face the impact of the changing climate?

Description

As we share information on extreme events this month, the British Red Cross share in this guest post how they, and the wider Red Cross movement, are supporting people and communities around the globe to adapt to our changing climate.

The British Red Cross, alongside the Red Cross, have been supporting people and communities impacted by severe weather events for decades right here in the UK and overseas. When Storm Arwen hit the UK our emergency response volunteers were on the ground to support over 3,000 people affected. With drought devastating communities across Southern Africa, we helped train people to source new ways of providing food and income for their families. And using technology to help predict when a harsh winter cold was arriving in Mongolia we were able to provide cash at the right time for farmers to care for their stock.

Getting people through emergencies is what we have always done and, as extreme weather events, like floods, storms, heatwaves, and droughts, increase due to our changing climate, our work is more vital than ever to help communities to become more resilient.

We're making sure communities are ready and we're helping them stay safe and adapt to the changing world around them and the impact of climate change. When we talk about 'adaptation' it means helping people urgently **change the way they live** including, the way people earn an income, grow food, build homes or look after their finances. Our teams do this by supporting people with new tools, skills and training so they can build resilience, focusing on locally-led adaptation where possible to empower communities to lead the change.

Adapting with new ways of earning an income

With many people relying on the weather to grow and sustain crops and livestock, the more frequent periods and unpredictability of drought and flash flooding across the world, can seriously affect their income. We help people find ways to earn an income where they don't have to rely on the weather. This might be through training people up in alternative fields of work or giving cash grants to buy what they need immediately and then invest in new ways to earn money.

Adapting with new farming techniques

Image credit: Shutterstock

We are helping train people to use innovative farming techniques in places like Zimbabwe and Kenya so they can grow crops in difficult weather conditions to feed their families or sell. Like in Zimbabwe, where Musa, a Red Cross volunteer, has been busy teaching climate-smart farming skills to rural communities*: "We teach climate-smart farming to subsistence farmers which supports them to grow food during drought. This help them to become less reliant on the rain, which is unpredictable. This means they can sell produce to pay for school fees for their children, they can buy medicine for family members who get sick or buy chickens or household items they might need. It empowers people in the long term, I've seen that people are really benefiting."*

Adapting with financial training

In flood-prone places like Bangladesh, we're supporting people with financial training, so they can strengthen their businesses. This includes information about how to organise and grow savings, to budget, to set up bank accounts and more. It means people can manage their money better when an emergency happens. *Misti in Bangladesh has been made homeless numerous times by cyclones. She is now a boat taxi driver and a grant from the Red Cross* Red Cross helped her to buy her own boat, so she can keep more of her earnings: *"I have a bank account. I'm saving money in case of an emergency. I don't have much cash in my hand but if I suddenly needed it, I can get that money from my account."*

With extreme weather events already becoming more common here in the UK and overseas, it is the

homes, livelihoods and health of the people impacted that are at risk. At the British Red Cross we are working tirelessly to support and promote early action to help communities become more resilient to the changing climate, so they are less vulnerable to risk and can adapt to the changing world around them.

You can see more of what we have shared on extreme events by following the #GetClimateReady hashtag on Twitter.

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